PROTEIN ENGINEERING AND NANOMEDICINE LAB
JÚLIA LORENZO

PROFILE

Our research group focuses on protein engineering towards the generation of functional nanocarriers and bioinspired nanomaterials with potential applications in both nanomedicine and nanotechnology. We are particularly interested in the development of biocompatible nanomaterials and the study of their biological properties and interactions under clinically relevant conditions. Our primary goal is to address the challenge of delivering these biocompatible nanocarriers to the brain via intranasal administration, which would enable effective treatment of neurological disorders such as glioblastoma and Parkinson's disease.

RESEARCH

RESEARCH INTERESTS

The research developed by the Protein Engineering and Nanomedicine group led by Prof. Julia Lorenzo at the Institute of Biotechnology and Biomedicine (IBB) of the UAB focuses on protein engineering for the generation of functional nanocarriers and bioinspired nanomaterials for applications in both nanomedicine and nanotechnology. Our team devotes special attention to the development of biocompatible nanomaterials and the study of their biological properties and interactions under clinically relevant conditions. Particularly, we focus our research on the development of nanocarriers for drug delivery by intranasal administration to avoid the Blood Brain Barrier.

STRATEGIC OBJECTIVES

Our scientific aim is to use nanotechnology to design innovative and effective nanomedicines. We develop nanomaterials intended to transport drugs and proteins across biological barriers and deliver them to target tissues. We are specialized in intranasal delivery for glioblastoma and Parkinson's disease treatment.

MAIN RESEARCH LINES

- Design and validation of nanocarriers and nanomaterials for biomedical applications related to brain disease diagnosis and treatment.
- Development of new drug delivery systems based on engineered enzymes for their use in enzyme replacement therapies.
- Intranasal delivery.
- Elucidation of the cellular roles of metallo-carboxypeptidases and their inhibitors for potential biomedical or biotechnological uses.

LAB FEATURED PUBLICATIONS

1. Mao X., Calero-Pérez P., Montpeyó D., Bruna J., Yuste V.J., Candiota A.P., Lorenzo J.*, Novio F., Ruiz-Molina D. Intranasal Administration of Catechol-Based Pt(IV) Coordination Polymer Nanoparticles for Glioblastoma Therapy**. Nanomaterials.** 2022, 12, 1221. doi: 10.3390/nano12071221. IF= 5.719/ Q1.

2. García-Pardo J., Novio F., Nador F., Cavaliere I., Suárez-García S., Lope-Piedrafita S., Candiota A.P., Romero-Gimenez J., Rodríguez-Galván B., Bové J., Vila M., Lorenzo J.*, Ruiz-Molina D. **ACS Nano.** 2021.15(5):8592-8609. doi: 10.1021/acsnano.1c00453. IF= 18.027/ Q1.

3. Djafari J., Fernández-Lodeiro A., Fernández-Lodeiro J., Santos H.M., Lorenzo J.*, Rodriguez-Calado S., Capelo-Martínez J.L., Lodeiro C.*. Study and Preparation of multifunctional Poly(L-Lysine)@Hyaluronic acid nanopolyplexes for the effective delivery of tumor suppressive MiR-34a into triple negative breast cancer cells. **Materials.** 2020. 20(23): 5309. doi: 10.3390/ma13235309. IF=3.623/Q2.

4. Garcia-Pardo J., Tanco S., Garcia-Guerrero M.C., Dasgupta S., Aviles F.X., Lorenzo J.*, Fricker L.D.* Substrate specificity and structural modeling of human Carboxypeptidase Z: A unique protease with a Frizzled-like domain. **Int. J. Mol. Sci.**
5. 2020, 21(22), 8687. doi: 10.3390/ijms2122868. IF = 4.556/ Q1.

6. Marcelo G.A., Montpeyó D., Ruiz-Molina D., Novio F., Lorenzo J.*, Oliveira E.*. Luminescent Silicon-based Nanocarrier for Drug Delivery in Colorectal Cancer Cells**. Dyes and Pigments**. 2020. 108393. doi: 10.1016/j.dyepig.2020.108393. IF= 4.613/Q1.

7. Suarez-Garcia S., Arias-Ramos N., Frias C., Candiota A., Arús C., Lorenzo J.*, Ruiz-Molina D., Novio F. Dual T1/T2 Nanoscale Coordination Polymers as Novel Contrast Agents for MRI: a Preclinical Study for Brain Tumor. **ACS Appl. Mater. Interfaces**. 2018, 10, 45, 38819-38832. doi: 10.1021/acsami.8b15594. IF: 8.097/Q1.

8. Garcia-Guerrero M.C., Garcia-Pardo J., Berenguer E., Fernandez-Alvarez R., Barfic G.B., Lyons P.J., Aviles F.X., Huber R., Lorenzo J.*, Reverter D.*. Crystal structure and mechanism of human carboxypeptidase O: Insights into its specific activity for acidic residues. **Proc. Natl. Acad. Sci**. 2018. Apr 24; 115(17):E3932-E3939. doi: 10.1073/pnas.1803685115. IF: 9.580/Q1.

9. Garcia L., Garcia-Pardo J., Tort O., Prior I., Brust M., Lorenzo J.*. and Puntes V.*. Trapping transmembrane cellular receptors inside the cell, avoiding receptor recycling and improving antibody therapy using gold nanoparticles. **Nanoscale.** 2017. 2017 May 11;9(18):6111-6121. doi: 10.1039/c7nr00947j. IF: 6.739/Q1.

10. Tanco S., Tort O., Demol H., Aviles F.X., Gevaert K., Van Damme P.* and Lorenzo J.*. Positional proteomics identification of the natural substrates of cytosolic carboxypeptidases. **Mol. Cell. Proteom.** 2015. Jan;14(1):177-90. doi: 10.1074/mcp.M114.040360. IF: 5.912/Q1.

11. Carné-Sánchez A., Bonnet C.S., Imaz I., Lorenzo J., Tóth E., Maspoch D. Relaxometry Studies of a Highly Stable Nanoscale Metal-Organic Framework Made of Cu(II), Gd(III), and the Macrocyclic DOTP. **J. Am. Chem. Soc**. 2013 Nov 27;135 (47):17711-4. doi: 10.1021/ja4094378. IF: 11.444/Q1.

12. Ojea-Jiménez I., García-Fernández L., Lorenzo J., Puntes V.F. Facile Preparation of Cationic Gold Nanoparticle-Bioconjugates for Cell Penetration and Nuclear Targeting. **ACS Nano.** 2012 6(9): 7692: 7702. doi: 10.1021/nn3012042. IF: 11.444/Q1. IF: 12.062/Q1.